

MONTHLY WEATHER REVIEW,

OCTOBER, 1879.

(General Weather Service of the United States.)

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

In preparing this REVIEW the following data, received up to October 14th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 157 Signal Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means 133 and 132 respectively, from the former; reports from 29 Sunset stations; 249 monthly registers from Voluntary Observers; 52 monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; monthly reports from Voluntary Observers in, and the local Weather Service of, Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon chart No. II is shown by the isobaric lines the general distribution of atmospheric pressure, as reduced to the sea level, for the month. The variations from the average pressure for the past seven years have been marked and general. East of the Mississippi river the pressure has been decidedly in excess save in the Gulf States. The excess in New England has ranged from 0.04 inch to 0.08 inch, except on Mount Washington, where it was 0.11. The greatest excess was in the Middle Atlantic States and the Lower Lake region, where it varied only from 0.09 inch to 0.11 inch. The deficiencies have been greatest in the Red River of the North valley, ranging from 0.08 to 0.11 inch, and in southern Florida from 0.04 to 0.06 inch. Deficiencies are reported in the Plateau District from Salt Lake of 0.03 inch, and from Virginia City of 0.04 inch, these being the only stations therein with seven years means. On the Pacific coast the pressure at San Deigo was normal, at San Francisco 0.01 inch in excess, and at Portland there was a deficiency of 0.035 inch.

The Local Barometric Ranges have been greatest in New England, over which section the severest storms of the month have passed. The ranges in that district have been unusually great, ranging from 1.38 inch at New Haven to 1.85 inch at Eastport. The range elsewhere of one inch and over includes the Middle Atlantic States, the Lake region, the Northwest, the Lower Missouri valley, North Carolina, the greater part of the Ohio valley, the Mississippi valley from Keokuk northward, and the Northern Plateau district. The range of 0.75 inch and below includes in its limits ten Gulf stations, the southern half of Texas and Georgia, the Southern Plateau district and southern California. The only ranges below 0.50 inch have been 0.40 at Los Angeles, 0.44 at Punta Rassa and 0.49 at Key West.

Areas of High Barometer.—Of these, seven have been deemed sufficiently marked to merit description.

No. I.—This area appeared on the Northern Pacific coast the afternoon of the 1st, and moving south-east by the morning of the 2nd was in Wyoming. Minimum temperatures of 32° were reported from Virginia City and Fort Custer, and 39° from Cheyenne. Moving northeast on the morning of the 3rd it had reached Minnesota, St. Paul barometer 0.23 above the normal. Its progress thus far had been marked by generally cool, clear weather, with no rain-fall. At that time freezing minimum temperatures were reported from northern Dakota and Minnesota. Moving slowly eastward its centre on the morning of the 4th was in Ontario; Toronto barometer 0.25 above the normal. Brisk southerly winds then prevailed on the Middle Atlantic coast, and at noon Cautionary Signals were displayed at Cape Hatteras and Kittyhawk. They

were lowered at midnight; justified by a maximum velocity of NE. 26 miles at Kittyhawk. The mid-night report of the 4th showed that the area had moved eastward over the Atlantic Ocean.

No. II.—On the afternoon of the 5th the barometer commenced rising in the lower St. Lawrence valley, and at the morning report of the 6th, Chatham barometer was 0.51 above the normal. Generally clear weather, with fresh northerly winds, then prevailed in the Canadian Maritime Provinces and Maine. Minimum temperatures of 25° at Father Point and 30° at Chatham were reported. Signals were displayed during the day on the Middle Atlantic and North Carolina coasts. Those on the New Jersey coast were lowered at midnight, justified by velocities ranging from E. 25 at Cape May to E. 32 miles at Sandy Hook. The signals on the North Carolina coast were not justified. The area moved southward during the 6th and 7th, and on the morning of the 8th the highest pressure was at Cape Hatteras—barometer 0.29 above the normal. The central pressure appeared to move northward during the night of the 8th and in the morning the highest pressure was over the Canadian Maritime Provinces, where it remained until its final disappearance on the 12th, the highest pressure during that time being at Chatham, where the barometer ranged from 0.29 on the 8th to 0.62 on the 12th above the normal. From the 8th to the morning of the 10th light local rains fell in New England and the Middle Atlantic States. On the afternoon of the 10th brisk north-east winds were reported on the New England coast, and Cautionary Signals were displayed from Wood's Holl to Eastport. These Signals were lowered the morning of the 11th, justified only at Eastport NE 26 miles. Severe gales, however, prevailed during that time in Newfoundland, doing great damage to property, driving several vessels ashore, and completely wrecking one barque.

No. III.—This area appeared in the Northwest the morning of the 12th, Duluth barometer 0.30 above the normal. At the afternoon report the highest pressure, still increasing, was over Lake Superior, and brisk southerly winds prevailed on lakes Superior and Michigan. Signals were then ordered for those lakes. Moving slowly eastward with generally clear weather and cool northerly winds, the centre the morning of the 13th was in Ontario, Parry Sound barometer 0.40 above the normal. Brisk northerly winds then prevailing on the Maine coast, an Off-shore signal was ordered for Eastport, which was lowered at midnight justified by a NW. wind of 26 miles. The Lake signals were then lowered, not justified except at Duluth, the maximum velocity being N. 21 at Milwaukee. From the 13th to the morning of the 16th the highest pressure remained over Ontario, Parry Sound barometer ranging from 0.18 to 0.38 above the normal. The area on the 16th moved eastward and remained with the highest pressure on the New Brunswick coast until its final disappearance on the 18th over the Atlantic ocean.

No. IV.—This area appeared on the California coast the morning of the 16th, San Francisco barometer 0.19, abnormally high. It moved eastward during the day and reached the Middle plateau district, where it remained until the afternoon of the 18th, when the highest pressure was at Denver, 0.49 above the normal. Moving northeastward during the day, on the morning of the 19th it was central over the Upper Lake region, Escanaba barometer 0.45 above the normal. At that time brisk to high northerly winds prevailed in the Lake region, with maximum velocities of 30 miles N at Cleveland, and 38 N at Sandusky. Minimum temperatures below or near the freezing point were reported from the entire Upper Lake region and the Northwest. Moving slowly eastward the highest pressure at the morning report of the 20th was over the Lower Lake region, over which section the barometer was quite uniformly 0.29 above the normal. At that time the Signals on the Atlantic coast from Smithville northward to Sandy Hook, and at Eastport were lowered having been justified as shown in connection with low areas Nos. IV and V. Changing its course to the southeast, on the morning of the 21st the area was central with diminished pressure on the New Jersey coast. It thence followed a northeasterly course and on the 22nd passed over the Gulf of St. Lawrence.

No. V.—This area appeared on the Northern Pacific coast the morning of the 21st, and in the afternoon the Olympia barometer was 0.32 above the normal. Moving eastward the highest pressure was over western Dakota on the morning of the 22nd, and at that time temperatures below or near the freezing point were reported from the Northwest. During the day the pressure rapidly increased from Dakota southward. In the afternoon, in connection with low area No. VI, rainy and threatening weather, with brisk to high winds, prevailed in the Upper Lake region, with a maximum velocity of NW. 35 miles at Milwaukee. Signals were then displayed for Lakes Michigan, Huron and Erie, which were justified as shown in description of low area No. VI. and Cautionary Off-shore signals were also ordered on the Texas coast. On the morning of the 23rd the isobar of 30.50 extended from Dakota southward to include Kansas—Bismarck, North Platte and Dodge City barometers respectively 0.59, 0.59 and 0.56 above the normal. Brisk to high northerly winds then prevailed in the Upper Lake region and in Texas. The isobar of 30.50 during the day covered the country from Indian Territory southward to Mississippi, but during the night moved slowly eastward and on the morning of the 24th covered the Upper Mississippi valley, St. Paul and Duluth barometers 0.57 above the normal. At that time minimum temperatures of 32° and under were reported from Indian Territory and Missouri northward to Manitoba, and from the greater part of the Lake region. Brisk northerly winds then prevailed in the Gulf States with maximum velocities of 26 N. at Galveston, 32 N. at Indianola and 34 NNE. at Port Eads. Brisk northerly winds with fair weather prevailed during the day in the Middle Atlantic, South Atlantic and Gulf States, fully justifying the Off-shore signals which had been displayed the afternoon of the 23rd from New York southward to Smithville. These signals were all lowered at midnight (24th) justified by velocities ranging from NW. 28 at Barnegat to NW. 52 miles at Cape May. The Texas signals were lowered at the same time, having been

fully justified by velocities of N. 28 at Galveston and N. 32 at Indianola. Moving slowly eastward the highest abnormal pressure on the morning of the 25th covered the Lower Lake region—Parry Sound barometer 0.75 above the normal. Minimum temperatures, at or below 32°, were then reported from the whole Lake region, New England, and the Middle Atlantic States—Rochester temperature, 19°. The Signals on the Atlantic coast were lowered too soon, as during the day severe northeast gales continued on the Middle and South Atlantic coasts, with velocities ranging from 25 to 47 miles, the maximum velocities being NE. 47 at Kittyhawk, and NE. 44 at Tybee Island. During the day the barometer rose rapidly in the Eastern Gulf States, but at midnight a slight fall was reported, and the northeast winds, increasing in force, had reached a maximum velocity of NE. 35 at Key West and ENE. 39 at Port Eads. Severe gales were reported from the Gulf which are treated in connection with low area No. VII. The area moved slowly eastward, the highest pressure the morning of the 26th being at Baltimore—barometer 0.73 above the normal, brisk to high northeast winds with partly cloudy weather prevailed during the day on the South Atlantic coast, the maximum velocity being 36 miles NE. at Cape Lookout. By the morning of the 27th, the central area had passed off the Middle Atlantic coast in advance of low areas Nos. VII and VIII. The passage of this area was marked by the minimum temperatures for the country east of the Rocky Mountains, except for the Lower Missouri and Upper Mississippi valleys, the Northwest and the Upper Lake region.

No. VI.—This area appeared on the North Pacific coast accompanied by light rain, the morning of the 25th and by the morning of the 26th the barometers at Olympia and Virginia City were 0.51 above the normal. At that time the pressure over the whole country was above the normal, being 30.70 in the Middle Atlantic and part of the New England States, 30.50 in Washington Territory and part of Idaho, and a small area of 30.40 in central Nebraska. Slight changes took place in connection with the centre of this area during the 27th, but the pressure gradually decreased and it slowly disappeared during that day and the 28th.

No. VII.—This area appeared in the Northwest at midnight of the 29th; Breckenridge and Bismarck barometers 0.22 above the normal. At this time, in connection with low area No. IX, brisk northwest winds, with threatening weather, continued in the Upper Lake region, where signals had been displayed on that afternoon. The pressure increased in the Northwest during the 30th, 30.50 over the greater part of Dakota; it moved slowly eastward, and by midnight was central over Lake Superior; Duluth barometer 0.50 above the normal. On the morning of the 31st minimum temperatures of 10° and under were reported from the Northern Rocky Mountain slope, the Northwest and northern portions of Missouri and Mississippi valleys. The lowest temperatures were 1° at Pembina and—1° at Deadwood, being with 0° on Mount Washington, the lowest reported during the month. This area was marked by the minimum temperatures for the Missouri and Upper Mississippi valleys, the Northwest and the Upper Lake region.

Areas of Low Barometer.—On map No. I are charted the tracks of the centre of eight areas of low barometer. Nine areas have passed over the country during October, but the path of area No. III was too uncertain to permit its accurate location.

No. I.—This area was a continuation of No. IX of the September Review. Central in Dakota the morning of the 1st, it moved northeastward and reached Manitoba by midnight, its progress marked by light rains and brisk southerly winds in the Northwest and Upper Lake region. Cautionary Signals were displayed at Milwaukee and Duluth during the afternoon, and at midnight for Lake Michigan and at Alpena and Marquette. On the morning of the 2nd, it was central in Northeastern Minnesota at which time cloudy weather and rain, with brisk southerly winds prevailed in the Upper Mississippi valley and on Lakes Michigan and Superior. By afternoon the centre had reached the eastern end of Lake Superior, at which time brisk westerly winds with cloudy weather and rain prevailed, and maximum velocities ranging from 28 to 32 miles were reported, from the Upper Lake region, while partly cloudy weather with fresh to brisk westerly winds prevailed in the Lower Lake region. Cautionary Signals were then displayed at Port Huron, Detroit, Toledo and Sandusky. At midnight the area was central north of the Lower Lake region, while cloudy and rainy weather prevailed with brisk to high southwest winds on Lake Huron and the western part of Lake Erie, with a velocity of SW. 38 miles at Saugeen. Cautionary Signals were then displayed for Lake Erie from Cleveland to Buffalo. On the morning of the 3rd the centre had reached the Lower St. Lawrence valley. Threatening and rainy weather with brisk to high southwest winds were reported from New England, and the Lower St. Lawrence valley. Signals were then displayed on the New England coast from Wood's Holl northward to Eastport. In the Lake region, cloudy or partly cloudy weather, with fresh westerly winds were reported, and all signals therein were lowered; these signals were justified by velocities ranging from SW. 25 at Grand Haven to W. 32 at Duluth, and SW. 38 at Saugeen, except at Escanaba, Marquette, Buffalo, Erie and Port Huron, where velocities ranging from 13 to 20 miles occurred. Changing its course to the southeast with decreased pressure, the area was central on the afternoon of the 3rd in the Gulf of St. Lawrence; Chatham barometer 0.29 below the normal. Signals on the New England coast were continued until the 4th, on account of the rapidly recovering pressure, and were lowered in the afternoon. They were justified except at Eastport, and a maximum velocity of W. 28 miles was reported at Thatcher's Island.

No. II.—On the morning of the 2nd this area appeared on the Oregon coast. During the day light rain fell in the North Pacific region, and the centre moving eastward was on the morning of the 3rd in

Montana—Virginia City barometer 0.26 below the normal. During the day brisk to high southerly winds prevailed in the Northwest, and by midnight the centre, with decreased pressure, had reached eastern Manitoba. On the morning of the 4th it was north of the Lake Superior region from which section brisk southerly winds were reported. Signals were then ordered for Lakes Superior and Michigan, except at Chicago. The centre moving northward these signals were lowered on the morning of the 5th, not having been justified, a maximum velocity of SW 24 only being reported from Marquette.

Area No. III.—The track of the centre of this area was too indefinite to permit its accurate charting. On the afternoon of the 3rd a new depression, accompanied by fresh southerly winds, threatening weather and light rains, appeared on the North Pacific coast, where by the afternoon of the 4th, the barometer steadily falling, reached at Olympia 0.60 below the normal. The area moving eastward, on the afternoon of the 5th caused an extensive barometric depression ranging from 0.20 to 0.50 inch below the normal, which covered the country from Minnesota and Iowa westward to the Pacific ocean. Slight changes occurred over this region until the midnight of the 5th, when the barometer again fell sharply on the North Pacific coast. On the morning of the 6th the line of normal pressure ran from Lake Superior southeastward to the Georgia coast. The country from Minnesota and Iowa westward to the Pacific coast was then covered by a pressure from 0.20 to 0.50 below the normal, while in the Gulf States the New Orleans barometer read 0.24 below the normal. At noon of the 6th Cautionary Signals were displayed at New Orleans and Port Eads, and in the afternoon at Mobile and St. Marks. On the afternoon of the 6th a decided decrease of pressure was reported from Oregon, Dakota and the Gulf States. Cloudy and rainy weather prevailed in the north and Central Pacific coast regions and in the Gulf States, while from Nebraska and Minnesota southerly gales were reported. Cautionary Signals were displayed at Duluth and Alpena. At midnight the Mobile barometer was 0.37 below the normal, while rainy weather, with brisk, variable winds, were reported from the Eastern Gulf States, with a maximum velocity of SE. 25 miles at St. Marks, and the tide rose five feet above the mean. But slight changes had taken place from the Upper Lake region westward to the Pacific. The morning report of the 7th showed a sharp barometric rise on the Oregon coast and in the Eastern Gulf States, with the centres of the depression apparently located in the Central Mississippi valley, Memphis barometer 0.30 below the normal, and in the Middle Plateau district, Salt Lake barometer 0.47 below the normal. During the 7th the depression in the Mississippi valley disappeared while the pressure from the Mississippi valley westward to the Pacific coast gradually recovering, by midnight was in a nearly normal condition, except from Colorado northeastward to Manitoba, where a barometric trough of 0.30 below the normal yet existed. The signal at Alpena was then lowered, the wind having attained a velocity of only SE. 20 miles. The barometric trough moved slowly northeastward and passed into Manitoba the morning of the 10th, when the Duluth signal was lowered not having been justified.

No. IV.—This area apparently developed in the Caribbean Sea, and on the afternoon of the 11th was central southeast of the Island of Jamaica. By the morning of the 12th it reached the eastern end of that Island, and by midnight of the 13th was central near the Island of Cuba, southwest of Havana. From the morning of the 11th until the afternoon of the 14th, 19.80 inches of rain-fall were reported from Kingston Jamaica. In the rest of the island exceedingly severe rains did serious injury to property and crops. Reports state that 13 lives were lost in Kingston. Many bridges, houses and much stock were swept out to sea, and all communication obstructed. The reports from the Gulf stations showing a steady decrease of pressure, a Cautionary signal was displayed at Key West the morning of the 12th. The cyclone moved slowly northeastward, and by the afternoon of the 14th, was central in the southeastern part of the Gulf. Signals were then displayed at New Orleans, Port Eads, Mobile and St. Marks. At this time Key West barometer was 0.31 below the normal, with a southeast wind of 26 miles, while fresh northeast winds were reported from the northeastern Gulf. The area moved slowly northeastward and at midnight of the 15th was central in the northeastern Gulf. At that time brisk southeast to northeast winds prevailed in the Eastern Gulf, States the Mobile barometer was 0.38 below the normal, while St. Marks reported a heavy rain of 2.36 inches in eight hours with a maximum velocity of E. 28 miles. The morning report of the 16th showed the centre over southern Alabama, Mobile barometer 0.51 below the normal. Brisk easterly winds were reported from Florida, with a maximum velocity of E. 32 at St. Marks, and a heavy rain-fall of 2.10 inches in eight hours from Montgomery. At noon Cautionary Signals were ordered for Jacksonville, Savannah and Charleston. By the afternoon of the 16th the centre had reached the central Mississippi valley, Memphis barometer 0.38 below the normal. The signals on the Gulf coast and from Jacksonville to Savannah were then lowered, having been fully justified. At midnight of the 16th reports showed it central with diminished energy in Illinois. Its subsequent track is described as that of area No. V., with which it united in Wisconsin on the morning of the 17th.

No. V.—This area appeared on the Oregon coast on the morning of the 11th, and during that afternoon was central in Oregon; Portland and Roseburg barometers 0.72 below the normal. At that time rainy weather, with light southerly winds prevailed in the Northern Pacific coast region. Moving slowly eastward it was central at midnight in the valley of the Columbia river; thence turning southward during the 12th, 13th and 14th, it moved slowly into the Southern Plateau district, its progress being marked by cloudy weather and light precipitation, light snow falling in Nevada. During the night of the 14th changing its course to the northeast, it was central the morning of the 15th in Colorado—Denver barometer 0.31 below the normal. By the morning of the 16th its centre was in western Dakota—Bismarck barometer 0.43 below the normal. At that time cloudy or rainy weather prevailed in the Upper Mississippi valley

and the Northwest. The afternoon reports showed its centre in Dakota. At that time northerly gales, with rain, prevailed in the extreme Northwest, and cloudy weather, with variable winds in the Upper Lake region. Cautionary Signals were then displayed for Lake Superior and at Escanaba. On the morning of the 17th, this area united with low area No. IV and reports at that time showed it to be central, with decreased pressure, in Wisconsin. Rainy or threatening weather, with fresh to brisk southerly winds then prevailed in the Lake region, with a maximum velocity of S. 26 reported from Sandusky. Cautionary Signals were then ordered for the rest of Lake Michigan and for Lake Huron. The afternoon reports of the 17th showed that the central area had passed northward beyond the Lake region. Brisk southwest to northwest winds yet prevailed in that section, with a maximum velocity of SW. 36 miles at Milwaukee. The course of this area during the 18th was too far north of the Lake region to permit accurate charting. During that time southwest to northwest winds, cloudy weather and rain prevailed in the Lake region. The signals displayed in that section were lowered on the afternoon of the 18th having been justified by velocities ranging from NW. 27 at Alpena to NW. 38 at Duluth. On the morning of the 18th signals were ordered on the Atlantic coast from Lewes northward to Sandy Hook. At midnight rainy and threatening weather, with brisk southerly winds, prevailed in the Middle Atlantic and New England States, with a maximum velocity of S. 28, at Cape May. Changing its course during the night to the southeast, on the morning of the 19th the area was central in Maine, Eastport barometer 0.30, abnormally low. Rainy and threatening weather then prevailed in New England and the Middle Atlantic States, with a maximum velocity of NW. 42 miles, at Sandy Hook. Cautionary Signals were then ordered from New York eastward along the coast to include Eastport, and in connection with high area No. IV from Norfolk southward to Smithville. By midnight the centre had passed through Nova Scotia and was over the Atlantic Ocean. During the day brisk northwest winds, with generally clear weather prevailed along the Atlantic coast from Eastport to North Carolina, and a maximum velocity was reported of N. 40 miles at Cape May. At that time the Cautionary Signals from Portland southward to include New York, were lowered having been justified by velocities ranging from NW. 25 at New Haven to NW. 38 at Thatcher's Island. On the morning of the 20th signals from Sandy Hook southward to include Smithville, were lowered, having been justified by velocities ranging from N. 32 at Macon to NE. 40 at Kittyhawk, and N. 40 at Cape May.

No. VI.—This area appeared in the Northwest on the 21st, moving southeastwardly from Manitoba, and at the afternoon report was central in Dakota, Pembina barometer 0.31 below the normal. Reaching southern Minnesota at midnight—its course thus far marked by no precipitation—it changed its direction to the northeast, and on the morning of the 22nd was central in northern Michigan. Moving eastward during the afternoon of the 22d, it was central over Lake Huron. At that time partly cloudy weather with brisk southerly winds prevailed over the Lower Lake region, while in the Upper Lake region rainy and threatening weather with brisk northwest winds were reported—maximum velocity NW 35 at Milwaukee. Cautionary Signals were then displayed for Lakes Michigan, Huron and Erie. At midnight the centre had reached Ontario—Parry Sound barometer 0.21 below the normal. At that time rainy or threatening weather, with brisk westerly winds prevailed in the Lake region and Middle Atlantic States, maximum velocities in the first section ranging from W 25 at Port Huron to W 30 at Alpena. Signals were then displayed for Lake Ontario, and were lowered at Escanaba, Chicago and Milwaukee, justified except at Escanaba by NW 36 miles at Milwaukee. Morning report of the 23rd showed the centre to be in the Upper St. Lawrence valley, Burlington, barometer 0.23 below the normal. Cloudy and threatening weather was then reported from New England and the Lower Lake region with brisk westerly winds, the maximum velocities in the latter district ranging from W. 25 at Toledo and Buffalo to W. 40 at Sandusky. A cautionary signal was then displayed at Eastport. The centre that afternoon was in Maine. The signals at Detroit and all on Lake Michigan, except Grand Haven, were then lowered having been justified, except at Escanaba, by velocities ranging from NW. 25 at Toledo to NW. 36 at Milwaukee. On the morning of the 24th the area having moved eastward was central over the Atlantic ocean. The signals on Lake Huron and at Grand Haven and Toledo were then lowered, and in the afternoon those yet remaining in the Lake region, having been justified, except at Oswego, by maximum velocities ranging from NW. 25 at Toledo to W. 45 at Sandusky. This area being rapidly followed by high area No. V, caused the storm to be unusually severe in the Lake region. A schooner and a steam barge were disabled on Lake Erie, and on Lake Huron one schooner was disabled, one driven ashore, and from a barge one man was lost. The signal at Eastport was lowered at midnight of the 24th not justified, the wind, however, attaining a velocity of S. 22 miles.

No. VII.—The morning and afternoon reports of the 25th showed rapidly increasing pressure in the Eastern Gulf States and Florida, while a slight decrease was reported from the Western Gulf States, with a NE. wind of 26 miles at Key West during the afternoon. At midnight a barometric fall was reported from the Eastern Gulf States, and high northeast winds then prevailed from Key West westward to Port Eads, attaining maximum velocities of 39 ENE. at Port Eads, and 34 NE. at Key West. During the 26th decreasing pressure and easterly winds prevailed in the Eastern Gulf, with maximum velocities of 26 NE. at Key West and 43 NE. at Port Eads. A schooner which left Key West on the 25th for Punta Rassa was compelled to return the morning of the 26th, on account of severe weather. Marine reports show violent easterly gales in the Eastern Gulf during all that day and the 27th. The Brigantine *Woodland* leaving Port Eads on the 25th was compelled to return in distress the 28th; schooner *Sallie* which left Pensacola on the

26th was completely wrecked and lost all her crew but two men. Three other vessels were disabled and in distress. The S. S. *Capri* reported a "hurricane" 200 miles ESE. of Port Eads on the 26th and 27th. On the afternoon of the 27th the area was central west of the middle Florida coast, Punta Rassa barometer 0.12 below the normal. No signals were displayed in the Gulf during the passage of this area. Moving very rapidly northeastward by midnight, the centre was probably off the Georgia coast. During the day very heavy rain fell in Georgia, Florida and South Carolina, with the following totals reported: Key West 1.36 inches, St. Marks 4.28, Jacksonville 2.21, Savannah 1.02 and Charleston, S. C., 1.94. On the morning of the 28th the area was probably central off the North Carolina coast; Cape Lookout reported the barometer 0.28 below the normal and Cape Hatteras 3.00 inches rainfall in eight hours. On the North Carolina coast fresh northerly winds were reported, their force being probably weakened by the influence of advancing low area No. VIII. Severe easterly gales were reported, however, on the eastern side of the area, northwest of Bermuda. During the day the area moved northward with great rapidity, and with diminishing pressure. Central in Rhode Island the afternoon of the 28th, by midnight it had united with low area No. VIII in Maine. During its passage northward on that day the winds on the Jersey coast veered to the westward, and the unusual maximum velocities of W. 48 at Sandy Hook and NW. 64 at Cape May were reported. Signals had been displayed on the Atlantic coast on the 27th for low area No. VIII, in connection with which they are considered. The subsequent path of this area is described as that of No. VIII.

No. VIII.—This area appeared in Manitoba during the night of the 26th, and moving southeastward was central on the morning of the 27th in Minnesota. Brisk westerly winds with partly cloudy weather and no precipitation then prevailed on Lakes Superior and Michigan. The afternoon reports showed the centre to be over the northwestern portion of Michigan, with greatly decreased pressure—Escanaba barometer 0.34 below the normal. Brisk southerly winds with cloudy weather prevailed in the Upper Lake region, with maximum velocities of 26 miles at Milwaukee and Grand Haven, while from the Northwest northwest gales were reported, with rain in the Upper Mississippi valley. Moving southeastward by midnight, the centre had reached, with still decreasing pressure, northern Michigan. At that time brisk southerly winds with threatening weather prevailed in the Lower Lake region, while in the Upper Lake region the winds had veered to northwest, and were brisk or high with maximum velocities reported of W 36 at Milwaukee, and NW 37 at Grand Haven. Cautionary Signals were then ordered at Grand Haven and for Lakes Huron, Erie and Ontario, except for Oswego. On the Atlantic coast, in connection with this area and high area No. VII, Cautionary Signals were displayed from Smithville northward, to include Cape Henry. At the morning report of the 28th the storm was central with decreased pressure in Ontario—Saugeen and Toronto barometers respectively 0.54 and 0.55 below the normal. Brisk southwest and south winds, with rainy or threatening weather prevailed in the Lower Lake region, while brisk to high northwest winds continued in the Upper Lake region. Maximum velocities of 36 miles were reported from Toledo, Sandusky and Grand Haven. Cautionary signals were then ordered for Oswego and on the Atlantic coast from Lewes northward to New York. The afternoon reports showed the area central in northern New York, Kingston barometer 0.55 below the normal. At this time in connection with low area No. VII a deep barometric trough ranging from 0.28 to 0.67 below the normal covered New England, the Middle Atlantic States, the Lower Lake region and Lake Huron. Cloudy weather and rain prevailed in New England and the Lower Lake region, with fresh to brisk variable winds in New England, and westerly winds, ranging from fresh to a gale, were reported from the Middle Atlantic States and Lower Lake region. Maximum velocities, ranging from 26 to 64 miles on the Jersey coast, were reported in connection with low area No. VII, and in the Lower Lake region ranging from 25 to 46 miles, in connection with area No. VIII. At this time area No. VIII was central in Rhode Island. Cautionary signals were then displayed at Portland and Eastport, and the Cautionary signals on the Atlantic coast from Smithville northward to New York were changed to Off-shore. Off-shore signals were also ordered from New Haven northward to include Thatcher's Island. At midnight areas No. VII and VIII united, with their centre in southeastern Maine. Portland barometer 0.90, below the normal. At this time variable winds prevailed in New England, with heavy rain and a northeast gale—48 miles—at Eastport. Brisk to high westerly winds, with generally clear weather, prevailed in the Middle Atlantic States and Lower Lake region, with maximum velocities on the Atlantic coast of W. 46 at Cape May and on the Lakes of SW. 35 at Sandusky. Moving northeastward the centre, on the morning of the 29th, was in New Brunswick, Eastport barometer being remarkably low, 28.82, or 1.16 below the normal; three hours earlier it had touched 28.775. At this time the reports for the preceding eight hours showed fall of the barometer in New Brunswick and Nova Scotia, ranging from 0.37 at Eastport to 0.56 inch at Chatham below the normal. Easterly gales then prevailed on the Atlantic coast as far south as Delaware, while brisk winds still continued in the Lake region in connection with advancing area No. IX. Signals were then lowered on the Atlantic coast from Cape Henry southward to Wilmington. In the afternoon the centre was in the Gulf of St. Lawrence, Halifax barometer, 28.82, or 1.06 below the normal. A barometric rise along the New England coast in eight hours, ranging from 0.15 at New London to 0.35 at Portland above the normal, caused a continuance of the brisk westerly winds. Maximum velocities ranging from SW. 25 at New London to W. 39 at Boston were reported, while in the Lower St. Lawrence valley a northwest gale prevailed at Father Point. The signals on the Atlantic coast—fully justified—from Lewes northward to New York were then

lowered. At midnight the centre was near Cape Breton, Sydney barometer 28.73, or 1.16 below the normal. Fresh to brisk westerly winds and clear weather then prevailed in New England and the Middle Atlantic States. During the 28th the passage of this area was attended by a series of remarkably severe gales in Nova Scotia, and from that section eastward over the Atlantic and along the Banks of Newfoundland. An immense amount of damage was done to property in Nova Scotia, and the storm was considered the worst for years. At Port Hastings, Cape Jack, Caribou Cove, Port Richmond, Antigonish, and Guysboro, N. S., many houses were destroyed. Probably a hundred vessels suffered more or less injury during the 28th and 29th, and with scarcely an exception they report the gales encountered as most violent. On the morning of the 30th the central area had passed eastward beyond the Canadian maritime stations.

No. IX.—This area appeared in Manitoba on the 28th, and moving southeastward at midnight was central in Minnesota, Pembina barometer, 0.57 below the normal. The barometric pressure of the whole country was below the normal except in the Plateau District and the Northern Pacific Coast region, the Lake region being covered by an abnormal pressure ranging from 0.19 to 0.60 below the normal. It caused this area to move eastward with great rapidity. On the morning of the 29th it was central with diminished pressure north of Lake Michigan, Marquette barometer 0.65 below the normal. Brisk to high westerly winds prevailed in the Upper Lake region, and brisk southerly in the Lower Lake region, with a velocity of .9 miles NW., reported from Milwaukee. Cautionary Signals were then ordered for all stations on the Upper Lakes. The afternoon report showed the central area to be east of Lake Huron. Westerly winds ranging from high to a gale were then reported in the Upper Lake region and Lake Erie, with maximum velocities ranging from 28 at Duluth, Marquette and Sandusky to 40 at Milwaukee and Saugeen. Cautionary Signals were then ordered for Detroit and for all stations on the Lower Lakes. During the day one steamer was wrecked and three schooners driven ashore on Lake Michigan. The storm was reported as being particularly violent over Lakes Michigan and Erie, being the heaviest northeast gale of the season at Cleveland. By midnight of the 29th the centre had reached northern New York, Burlington barometer 0.62 below the normal; the isobar of 30.50 at that time extended through New England, the St. Lawrence valley, and part of Ontario and New York, while the pressure of 0.74 below the normal yet prevailed over Nova Scotia in connection with area No. VIII. The morning report of the 30th showed that the area had moved rapidly northeastward and that it was central in the Lower St. Lawrence valley, Father Point barometer 0.65 below the normal. Brisk to high westerly winds then prevailed in the Lower Lake region, where maximum velocities changing from 26 to 37 miles were reported. Off-shore signals were then displayed on the New Jersey coast, and the Cautionary signals at Eastport and Portland were then changed to Off-shore, while the Off-shore signals from New Haven to Boston displayed in connection with low area No. VIII remained. All signals on the Upper Lakes were then lowered, having been justified by winds ranging from NW. 38 at Marquette, Escanaba and Duluth to W. 40 at Milwaukee. During the afternoon of the 30th the storm was central over the Gulf of St. Lawrence, and Cautionary signals in the Lower Lake region were then lowered, justified by velocities ranging from W. 30 at Rochester to W. 37 at Cleveland. At midnight all Off-shore signals from Eastport southward to Cape May were then lowered, having been fully justified. These signals were lowered somewhat soon as brisk to high northerly winds continued on the Atlantic coast until midnight of the 31st, with maximum velocities ranging from 28 at Cape Lookout and Portland to 33 at Boston and 42 at Cape May.

INTERNATIONAL METEOROLOGY.

Three International Charts, Nos. IV, V and VI, accompany the present *Review*. No. IV indicates the probable course of low-pressure areas over the North Atlantic Ocean and neighboring waters and continents during the month of September, 1879, and is based upon data received at this office up to October 31st, 1879. Nos. V and VI are charts for the month of March, 1878, and are based upon International Simultaneous Observations, as described in the *Review* for July, 1879, supplemented by such other observations as have been considered specially applicable and trustworthy.

On Chart No. IV the tracks of eight areas of low pressure are traced, which, during a portion of their existence, were located over the North Atlantic Ocean. Areas I, III, IV and VI are prolonged tracks, portions of which have already appeared on Charts I and IV of the *September Review*. No. I was probably central on the morning of September 1st about 60° N., 40° W. On this day southerly winds prevailed over the Atlantic, between 45° and 55° N., veering to SW. and W. westward of 30° W.; strong SW. gales, squally and rainy weather and confused or high westerly seas were reported between 30° to 45° W., and 46° to 53° N. On the 2nd a sudden fall of the barometer occurred over the northern portions of the British Isles and the depression moved eastwardly to the coast of Norway. A "heavy" gale prevailed along the north coast of Ireland and a "violent" gale was experienced in the northeast of Scotland, doing about \$2,000 damage to boats engaged in the herring fisheries; "captains of river steamers arriving at Glasgow reported the weather down the frith of Clyde as fearful." The winds over the Atlantic between 45° and 54° N. changed to SW. eastward of 30° W., and to northerly westward of that meridian. No. II appeared about mid-ocean in 45° N. on the 4th, on which day easterly winds generally prevailed from 10° to 33° W. in about 50° N. with thick weather and rain near centre of depression; on the 5th it had moved northward, followed by rapidly rising and high barometer from the 30th meridian westward, as the "anti-cyclone" or area of high barometer, which had covered the British Isles since the passage of preceding low area, moved slowly away in an easterly direction; on the 6th the barometer fell over the British Isles, with southerly winds and rising tempera-